Not to be cited without
permission of the author(s)[1]

Ne pas citer sans
autorisation des auteur(s)[1]

Canadian Atlantic Fisheries
Scientific Advisory Committee

CAFSAC Research Document 85/77

Comité scientifique consultatif des
pêches canadiennes dans l'Atlantique

CSCPCA Document de recherche 85/77

Scotia-Fundy Shrimp Stock Status - 1984

By

M.L. Etter and R.K. Mohn
Invertebrates and Marine Plants Division
Fisheries Research Branch
Scotia-Fundy Region
Halifax Fisheries Research Laboratory
Department of Fisheries and Oceans
P.O. Box 550
Halifax, N.S.
B3J 2S7

[1]This series documents the scientific basis for fisheries management advice in Atlantic Canada. As such, it addresses the issues of the day in the time frames required and the Research Documents it contains are not intended as definitive statements on the subjects addressed but rather as progress reports on ongoing investigations.

Research Documents are produced in the official language in which they are provided to the Secretariat by the author(s).

[1]Cette série documente les bases scientifiques des conseils de gestion des pêches sur la côte atlantique du Canada. Comme telle elle couvre les problèmes actuels selon les échéanciers voulus et les Documents de recherche qu'elle contient ne doivent pas être considérés comme des énoncés finals sur les sujets traités mais plutôt comme des rapports d'étape sur les études en cours.

Les Documents de recherche sont publiés dans la langue officielle utilisée par les auteur(s) dans le manuscript envoyé au secrétariat.

ABSTRACT

The Scotia-Fundy shrimp fishery consists mainly of three areas known as Canso, Louisbourg, and Misaine holes. As in the past it continues to be underexploited as only 928 t (16%) of the total quota of 5700 t was taken. This represents an exploitation rate of 5% based on the spring biomass estimate. Three research cruises were done in 1984 (May, July, and October) with results revealing decreased catch rates from 1983, particularly in the Canso and Louisbourg areas.

RÉSUMÉ

La pêche à la crevette dans la région de Scotia-Fundy est concentrée principalement dans trois secteurs connus sous les noms de Canso, Louisbourg et Misaine holes. Comme par le passé, les stocks restent sous-exploités, puisque la prise (928 t) ne représente que 16 % du contingent total (5 700 t). Si l'on se fonde sur l'estimation de la biomasse établie au printemps, cela correspond à un taux d'exploitation de 5 %. Les résultats de trois missions de recherche, effectuées respectivement en mai, juillet et octobre 1984, révèlent une baisse des taux de prise par rapport à 1983, particulièrement dans les secteurs de Canso et de Louisbourg.

103-02260/

METHODS AND RESULTS

Research Data

Research tows were carried out for half hour durations at a speed of 2.5 knots using a Yankee 36 trawl with a 32 mm mesh size. The results of these surveys are displayed in Table 1 and graphically in Figures 1, 2, and 3. The holes are defined by the 100 fathom depth contour, where stations were allocated randomly inside the single strata for Canso and Louisbourg holes. The Misaine stations were random stations from previous cruises, which were revised to save searching time for fishable bottom.

The shrimp fraction by weight, approximately 19% of the total catch (Table 2) was lower than last year's value of 37% but comparable to the previous year's 20%. As before, the commercial logs and observer data show a higher catch percentage of shrimp than the research cruises, presumably because the fishing captains are directing for clean catches. A potential problem exists with the redfish by-catch as it is frequently above the 10% by catch limit in commercial as well as research tows. The length frequency distribution figures are based on measurement of carapace length, to 0.1 mm and then grouped into 0.3 mm groupings. The number at the top of each figure is the number of individuals in the total sample. Figure 4 separates the data by area showing similar distributions for the three holes. Grouping the data by sex we get Figure 6. In comparing the graphs from 1982-84 spring/fall research cruises we can see the large portion of transitionals present in the spring, disappear from the population in the fall. We also detect two peaks of males (especially in '82 and '84), supposedly representing two year classes which can be followed from spring to fall where they peak at a slightly higher length. Figure 7, based on data from experimental stations at depths <100 fathoms, shows basically the same size distribution as was found at depths >100 fathoms. From this it may be inferred that the biomass of the population is larger than estimated. An interesting note from this graph is that males and females are both present suggesting no competition for preferred bottom type. Figures 9 and 10 compare shrimp catch to time of day, for the research cruises done in 1984 and spring cruises in the past, while shrimp catch by depth is plotted in Figures 11 and 12. None of these graphs seem to show any pattern, suggesting that depth of tow or hour of day have no consistant effect on shrimp catch and need not be corrected for.

As an index of stock health, the number of ovigerous females was compared to those non-ovigerous (Table 5). In the fall virtually all females are ovigerous; in our sampling approximately 78 out of 15,649, were not ovigerous.

Commercial Data

Commercial data for this report came from the logbooks, the Fisheries Observer Program and the Foreign and Domestic Quota Monitoring Unit, Fisheries Operations Branch. The logs were at 70% coverage with the official statistics for these areas.

The average catch rate for the year (Table 3) from the logs for Canso was 92.2 kg/h corrected for Yankee 36 trawl while for all gear types it was 101.8 kg/h. In Louisbourg the average catch rate was 72.1 kg/h for Yankee 36 (all gears - 113.0 kg/h). Misaine had a limited total effort of 59 h with a catch rate for Yankee 36 of 106.9 kg/h. The overall average was 78.0 kg/hr, similar to previous years (Table 4). Although it remained the same as last years', anecdotal information suggests there was a higher preponderance of males in Canso this year which is colaborated by Figure 6. Traditionally, Louisbourg has larger animals which may be a reason for increased catch and effort in Louisbourg and a decrease in catches from Canso.

Observer data and commercial logs seem to agree on catch and effort information. Length frequencies done by the observers shown here in Figure 5 (grouped in 0.5 mm groupings), appear very similar when compared to length distribution from research cruises.

This year nine new licenses were issued to the smaller sized Cape Breton based boats. Logs were received from five of these boats while eleven of the New Brunswick fleet reported fishing this area. These Cape Breton boats reported catching about 20% of the 928 t caught this year. All boats reported higher catch rates in the first few months dropping off rapidly as the season wore on (Table 3). Looking at Table 6, suspicion is cast on the use of swept area for determining biomass estimates because these uncorrected catch rates are very similar for different types of gear.

Figure 13 shows monthly catch rates from the commercial fishery and Fisheries' research cruises starting in 1977. The research cruises show a probable increase in biomass not depicted by the commercial rates which may be due to a preponderance of males in the population. There is also a slight trend of falling catch rates through each year. Effort in the commercial fishery usually starts in Canso, and when the catch rates start to fall here, some boats switch to Louisbourg where catch rates are high causing a "bump" in the monthly data. This usually levels out and catch rates decrease steadily from there. The overall picture doesn't seem to show a depletion of the resource over the years.

Biomass Estimates

For each hole the biomass was estimated by areal expansion, where the horizontal opening of the research gear was assumed to be 36 ft. The standard tow was ½ h at 2.5 knots giving a length of 1.25 nautical miles and a swept area of approximately 1/135 of a square nautical mile. The areas of the three holes measured by a polar planimeter, (using the 100 fathom contour) were for Canso, Louisbourg, and Misaine respectively 276.4, 472.2 and 442.2 square nautical miles. The tows were not corrected for length as defined by the start and end positions. Tow lengths as seen in Figure 8, ranged from 1.2 to 1.95 km. Since longer tows show no relation to higher catches there seems no need to correct for tow length. (Although greater precision during the tows would be advantageous). The average catch rates from the research cruises were standardized to Western 2A catch rates by multiplying by 1.5 to account for the vertical distribution above the Yankee 36 (Labonté, 1980).

Biomass, standard error, and proposed catch levels from survey data, 1984 (t).

Cruise	May	July	October	Avg	Recommended Catch levels*
Canso	4,758± 726	3,340±1,045	1,578± 530	3,190	1,100
Louisbourg	6,882±1,384	-	3,637± 618	5,260	1,800
Misaine	7,169±1,363	-	5,658±1,431	6,413	2,200

*Rounded to nearest hundreds.

Average catch (kg) per tow-research cruises.

	Canso	Louisbourg	Misaine
1982	52.8	42.2	32.6
1983	126.3	77.1	119.4
1984	57.0	55.0	71.3

The catches in the May, July, and October 1984 cruises were down significantly from 1983's high values.

Recommended Catch Levels

The recommended catch levels were derived from the biomass estimates using an exploitation rate of 35% as was used in previous analysis and recommended by CAFSAC. These are based on the average biomass. If it is desired they can be based on the May 1984 estimates which would raise the total recommended level to 6600 t.

Quotas (t)

	Canso	Louisbourg	Misaine	Total
1980	1,086	1,553	2,382	5,021
1981	-	-	-	-
1982	1,000	1,400	1,800	4,200
1983	1,400	2,000	2,400	5,800
1984	1,400	1,800	2,500	5,700
1985*	1,100	1,800	2,200	5,100

*Proposed values.

The proposed quotas for 1985 are close to, but slightly down from, previous years set values.

DISCUSSION

The biomass estimates are closer to the long-term average this year. Total catches didn't increase over 1983 possibly due to a preponderance of males in the catches. The strong male peak seen last year appears to have dominated the population in early 1984. The fishery is still below the recommended exploitation level and increasing this level would seem to have little effect on the catch. Also, unless these exploitation rates were to increase, the observed larger area of population production is not an important consideration. It is expected that next year, because the large numbers of males seen in 1984 will have changed to female, the outlook on the fishery will be more attractive to commercial interest. It also appears that the influx of new boats did not have a major effect on the fishery. The high research biomass estimates in 1983 seen in Table 7, were not reflected in the fishery. This appears to be at least partially due to the high fraction of partially recruited males in this estimate. Also the strong pulse of males in 1983 did not appear as transitional or subsequent females in 1984 as shown in Figure 6. This may be due in part to a density dependent effect on the males in times of very high abundance. More observations are required before the relationship between recruits and pre-recruits can be described. Finally, the biomass resident in Misaine hole may contribute fully to a fishable biomass if exploitation approaches recommended catch levels. This area is not easily fished and considerations as to what effect the areas have on one another would be required to produce a more realistic total recommended catch level.

REFERENCES

Labonté, S.S.M. 1980. An assessment of shrimp stocks off southeast Cape Breton, south Esquiman and north Anticosti. CAFSAC Res. Doc. 80/67.

Table 1: Research information from scientific research cruises.

Cruise	Area	Set	Depth (fm)	Bottom temp.	Shrimp (kg)	Total catch (kg)
May 1984	Canso	1	106	-	168	371
		2	105	-	143	308
		3	105	2.1	57	181
		4	106	-	59	600
		5	118	-	92	293
		6	122	2.5	73	291
		7	140	-	84	390
		8	144	2.8	34	273
		30	112	3.5	61	162
		31	142	3.9	79	223
	Louisbourg	11	150	5.1	135	180
		12	133	-	67	162
		13	139	-	-	3670
		14	142	5.0	115	242
		15	146	5.0	111	344
		16	135	5.1	113	401
		17	154	-	73	151
		18	163	5.4	50	100
		19	184	-	19	133
		20	144	5.7	36	241
	Misaine	10	130	-	14	67
		21	136	-	141	218
		22	142	4.0	43	116
		23	129	-	75	170
		24	160	-	50	111
		25	137	4.3	101	244
		26	120	-	69	312
		27	118	-	160	256
		28	117	3.5	112	208
		29	106	-	32	169
July 1984	Canso	2	45	-	1	380
		3	124	-	49	63
		4	127	-	96	108
		5	90	-	14	74
		6	100	-	56	109
		7	95	-	8	97
		8	103	-	34	79
		9	85	-	2	137
		11	66	-	-	727

...Cont'd.

Table 1. Cont'd.

Cruise	Area	Set	Depth (fm)	Bottom temp.	Shrimp (kg)	Total catch (kg)
October 1984	Canso	1	107	-	8	374
		2	105	4.3	40	361
		3	91	-	51	203
		4	97	-	1	784
		5	117	4.3	9	967
		6	121	-	75	425
		7	100	-	6	704
		8	131	-	1	341
		9	136	4.2	1	506
		10	90	4.7	7	144
		11	131	-	50	256
		12	151	3.8	77	301
		13	113	4.4	8	339
		38	100	-	13	54
	Louisbourg	14	136	4.9	16	314
		15	147	5.1	39	224
		16	138	4.4	48	278
		17	123	5.1	30	415
		18	112	5.0	69	975
		19	132	-	68	334
		21	139	-	21	208
		22	153	5.0	33	163
		23	152	-	9	91
		24	138	-	47	267
		25	99	-	72	581
		26	142	-	48	392
		27	142	-	22	187
	Misaine	28	125	3.6	186	414
		29	130	-	83	206
		30	131	3.6	53	407
		31	160	-	97	280
		32	132	4.2	56	331
		33	115	4.6	36	286
		34	116	-	49	181
		35	130	4.2	19	94
		36	121	-	15	101
		37	113	-	35	297

Table 2. Percentage catch composition of shrimp tows.

Species	April	May		June		July	August		September		October	
	Com[1]	Cru[2]	Com[1]	Com[1]	Cru[2]	Com[1]	Obs[3]	Com[1]	Obs[3]	Com[1]	Cru[2]	Com[1]
Shrimp	94.3	22.4	66.4	60.5	71.6	57.8	68.7	60.3	69.6	75.6	13.2	59.3
Cod	5.5	23.8	12.4	7.9	10.4	12.4	8.6	7.2	13.5	15.7	18.1	6.6
Redfish		42.2	19.5	29.0	1.2	26.6	5.2	28.8	1.9	7.1	17.3	29.2
Flatfish		5.0	1.1	1.2	7.6	1.5	5.6	2.2	6.8	1.6	9.0	4.0
Hake			0.1	0.1			7.4	0.4	3.4		35.3	0.6
Halibut							0.3		0.1			
Haddock	0.3		0.2	0.9	1.2	0.7	0.2	1.1	0.1			0.1
Pollock			0.3	0.3		0.8	0.1		0.1			
Miscellaneous		6.6			8.0	0.1	3.9		4.5		7.1	
Total shrimp catch (kg)	2862	2366	181226	244622	179	134058	6055	92731	16078	11119	1289	9429

[1]Commercial Log Data.
[2]Research Cruises.
[3]Observer Data from Commercial Boats.

Table 3. Monthly commercial information for Canso and Louisbourg areas (1984).

	April	May	June	July	August	September	October	Yearly
Canso:								
Catch (kg)		45,044	74,437	48,305	21,688	7,981	317	197,772
Effort (un)		367	693.5	513	257	105	8	1,943.5
Effort (cor)		367	772.5	618.4	257	119.7	10.4	2,145
CPUE		122.7	96.4	78.1	84.4	66.7	30.5	92.2
Louisbourg:								
Catch (kg)	4,011	147,490	160,908	62,529	58,905	718	5,630	440,191
Effort (un)	43	1,187	1,236.5	673.5	680	12	64	3,896
Effort (cor)	55.9	1,843.8	1,997.1	1,078	1,034.8	15.6	83.2	6,108.4
CPUE	71.8	80.0	80.6	58.0	56.9	46.0	67.7	72.1
All areas:*								
Catch (kg)								646,159
Effort (un)								5,898.5
Effort (cor)								8,330.1
CPUE								77.6

*Includes Misaine

Table 4. Scotian Shelf commercial shrimp landings and standardized (Yankee 36) CPUE.

Year	Catch (t)				CPUE (kg/hr)
	Canso	Louisbourg	Misaine	Total	
1977				269	105
1978				306	97
1979	534	295	8	838	128
1980	360	491	133	984	97
1981	10	418	26	454	93
1982	201	316	52	569	80
1983	512	483	15	1,010	81
1984	318	600	10	928	78

Table 5. Numbers of ovigerous/non-ovigerous individuals in samples from research cruises.

	Spring				Fall		
	Apr 82	May 83	May 84	July 84	Nov 82	Nov 83	Oct 84
Non-ovigerous females	2,638	1,330	2,574	159	52	11	15
ovigerous females	650	2,085	12	7	7,016	2,917	5,716

Table 6. Catch rates (kg/hr) for commercial boats off SW Cape Breton, 1984.

No. of Boats	Gear Type	Area				Cor. Factor
		Canso	Louisbourg	Misaine	All	
1	Terra Nova	114.89	-	-	114.89	3
3	Western 3A	131.19	119.07	-	119.51	2
3	Western 2A	-	110.85	-	110.85	1.5
2	Yankee 41	104.68	109.94	138.92	110.28	1.3
5	Yankee 36	100.14	70.58	-	99.51	1
2	Pair Trawling	77.40	-	-	77.40	-

Table 7. Research vessel biomass estimates (t)

Year	Area		
	Canso	Louisbourg	Misaine
1978	3,900	5,600	-
1979	2,900	4,300	9,600
1980	-	-	-
1981	3,000	4,100	5,000
1982	3,000	4,000	2,900
1983	7,100	7,400	10,700
1984	3,190	5,260	6,413

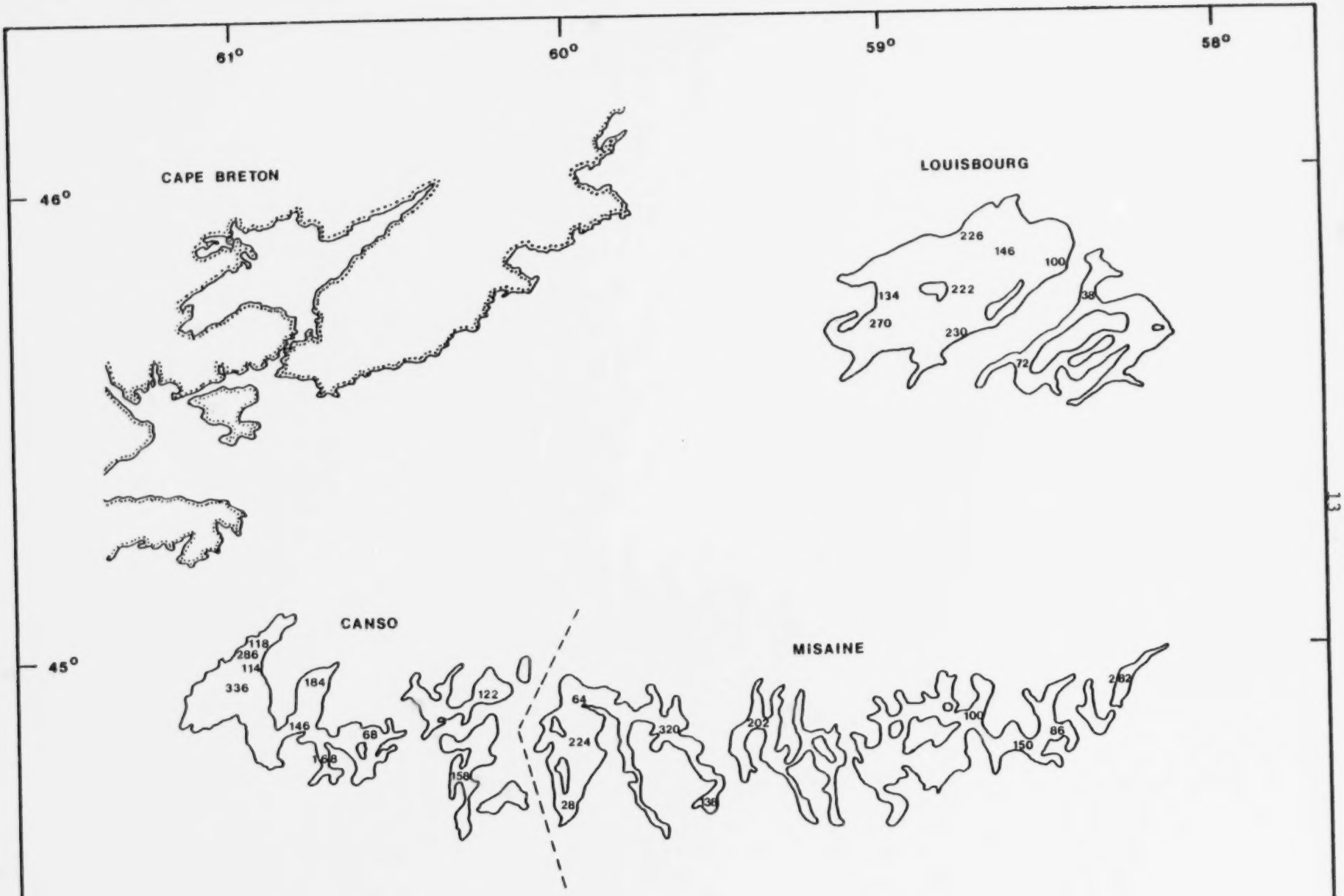

FIGURE 1. CATCH RATES (kg/hr) FOR MAY 1984 RESEARCH CRUISE.

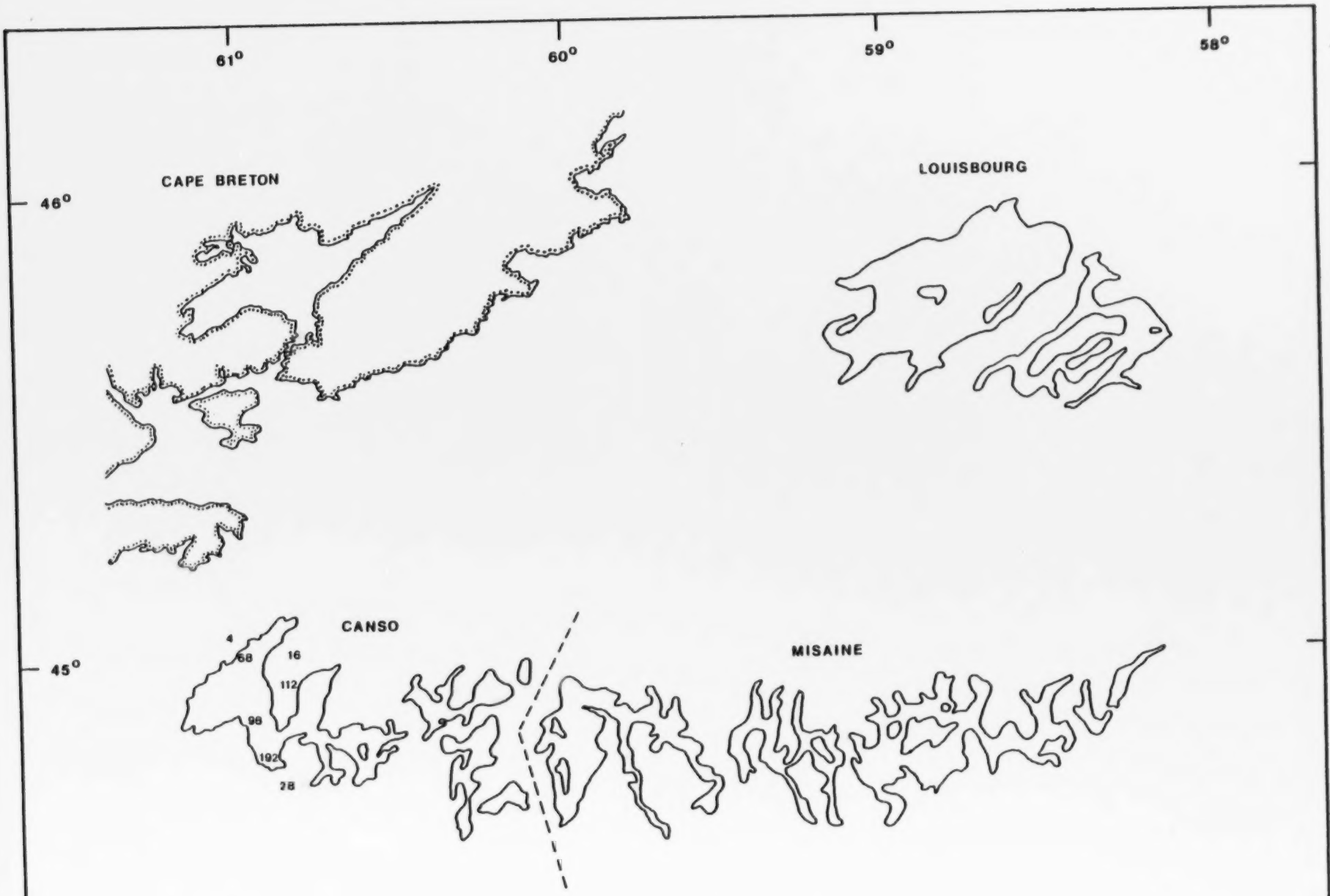

FIGURE 2. CATCH RATES (kg/hr) FOR JULY 1984 RESEARCH CRUISE.

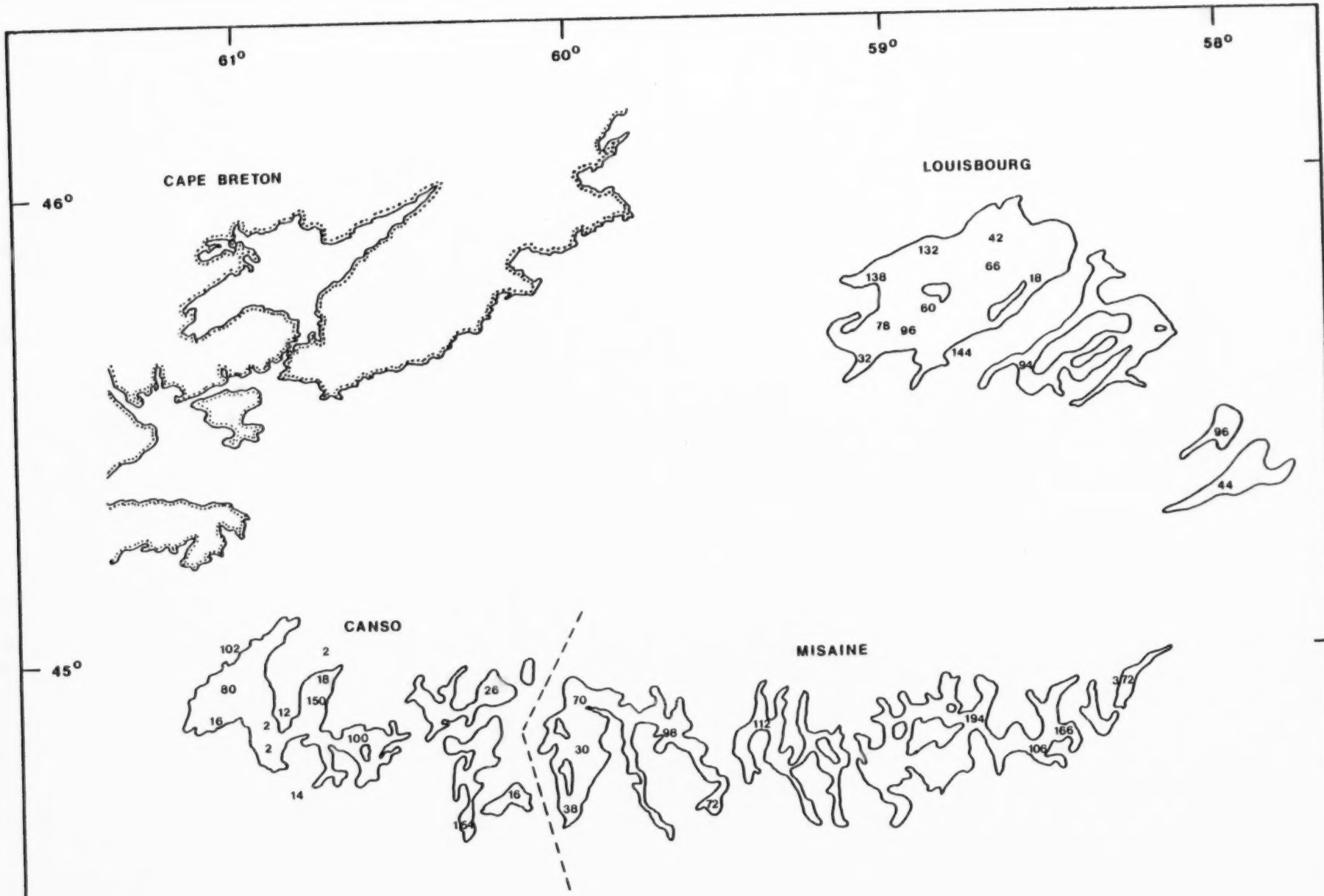

FIGURE 3. CATCH RATES (kg/hr) FOR OCTOBER 1984 RESEARCH CRUISE.

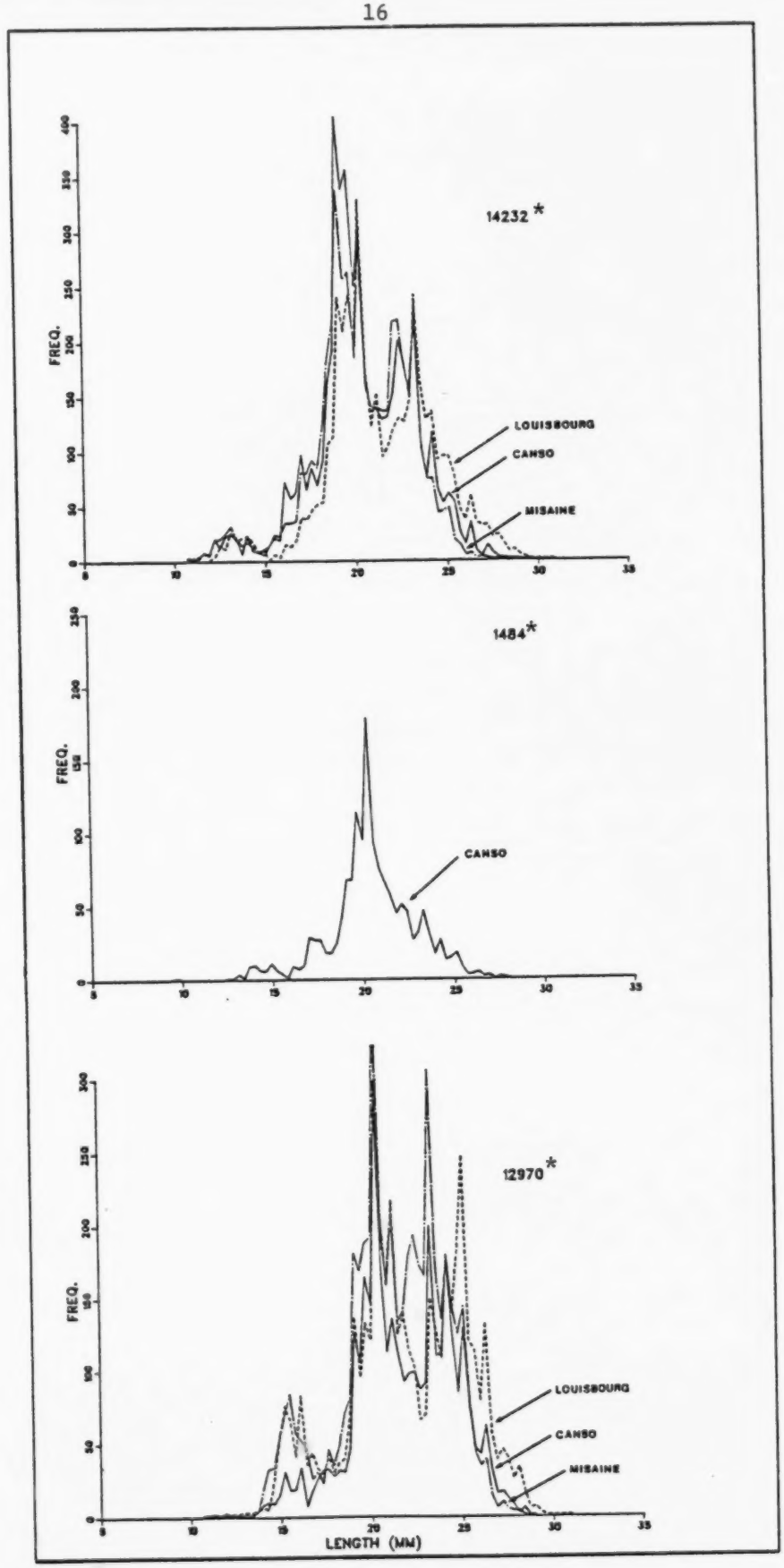

Figure 4. Shrimp length frequencies by area, 1984.
*Number of individuals in the total sample.

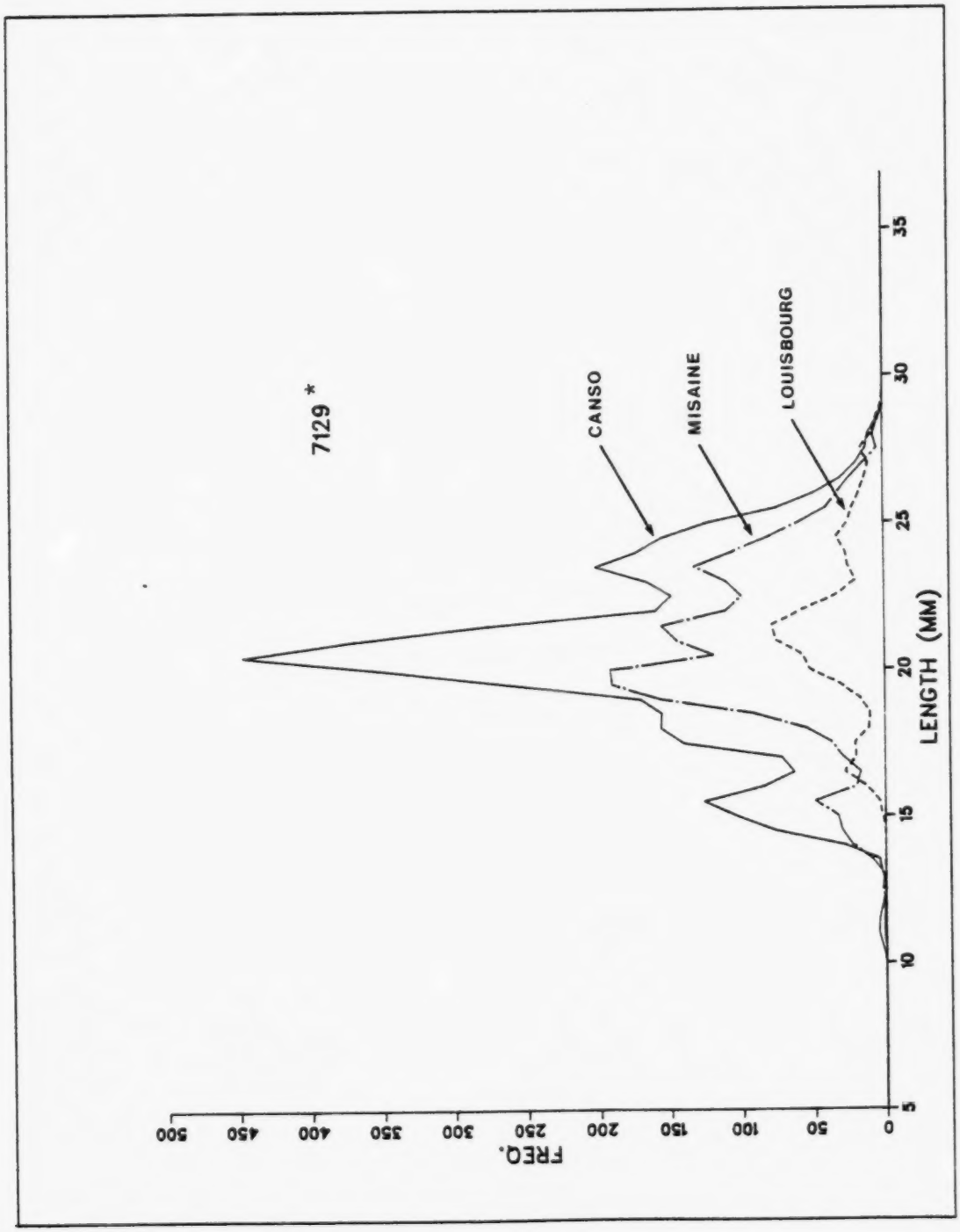

Figure 5. Shrimp length frequencies by area. (Observer data Aug.- Sept. 1984)
*Number of individuals in the total sample.

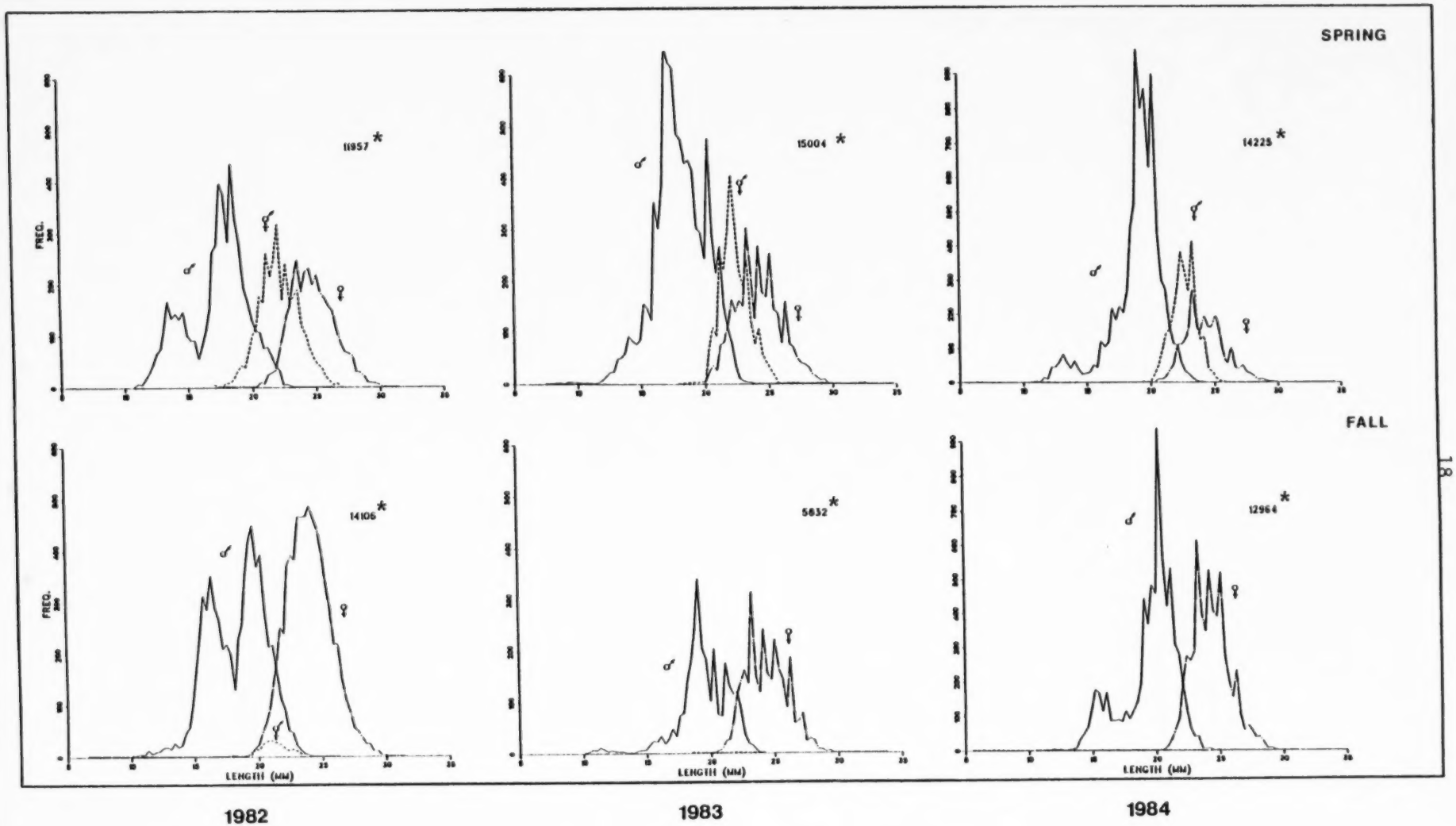

Figure 6. Shrimp length frequencies by sex for spring/fall research cruises.
*Number of individuals in the total sample.

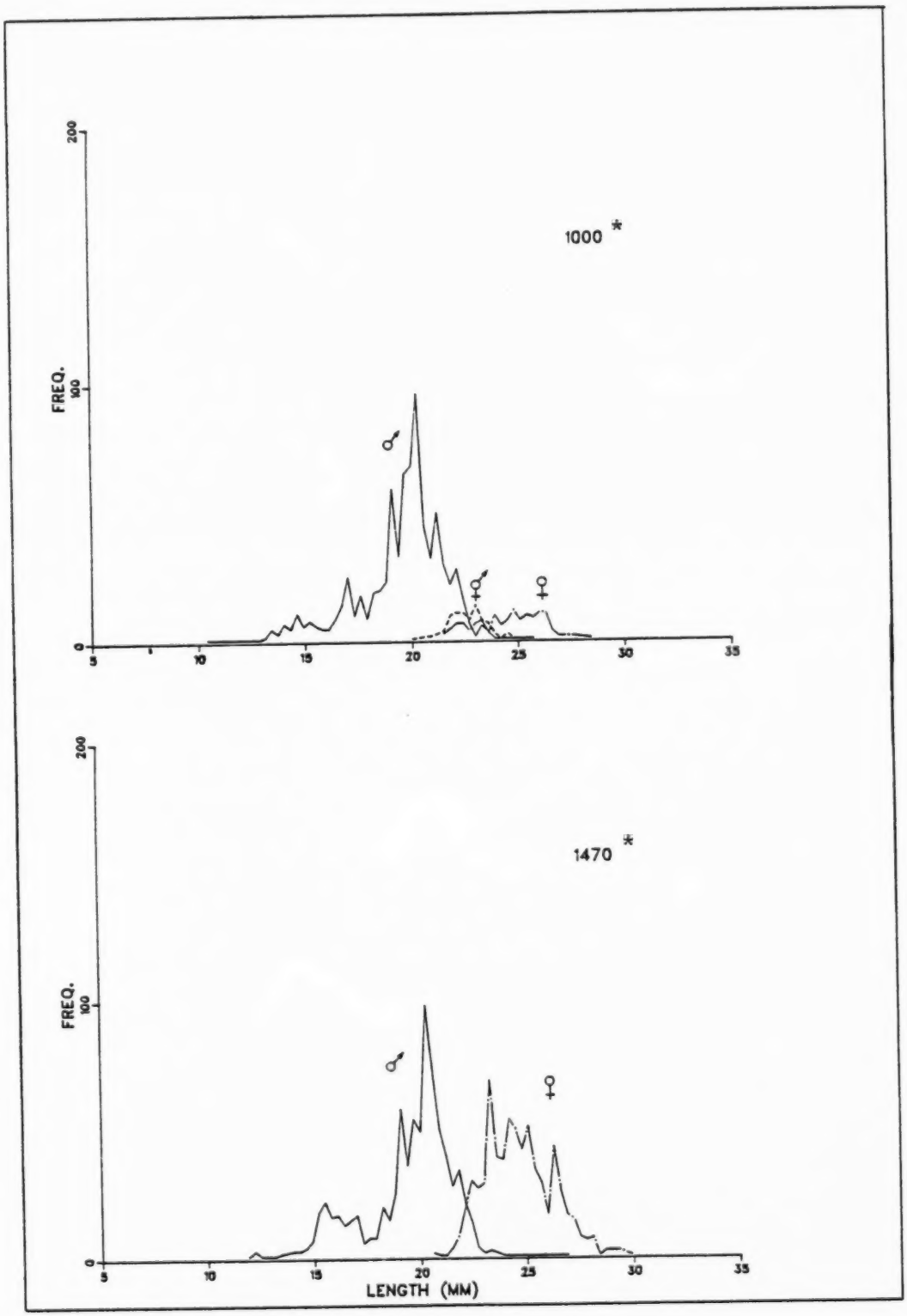

Figure 7. Shrimp length frequencies by sex. (depth < 100 fm.)
*Number of individuals in the total sample.

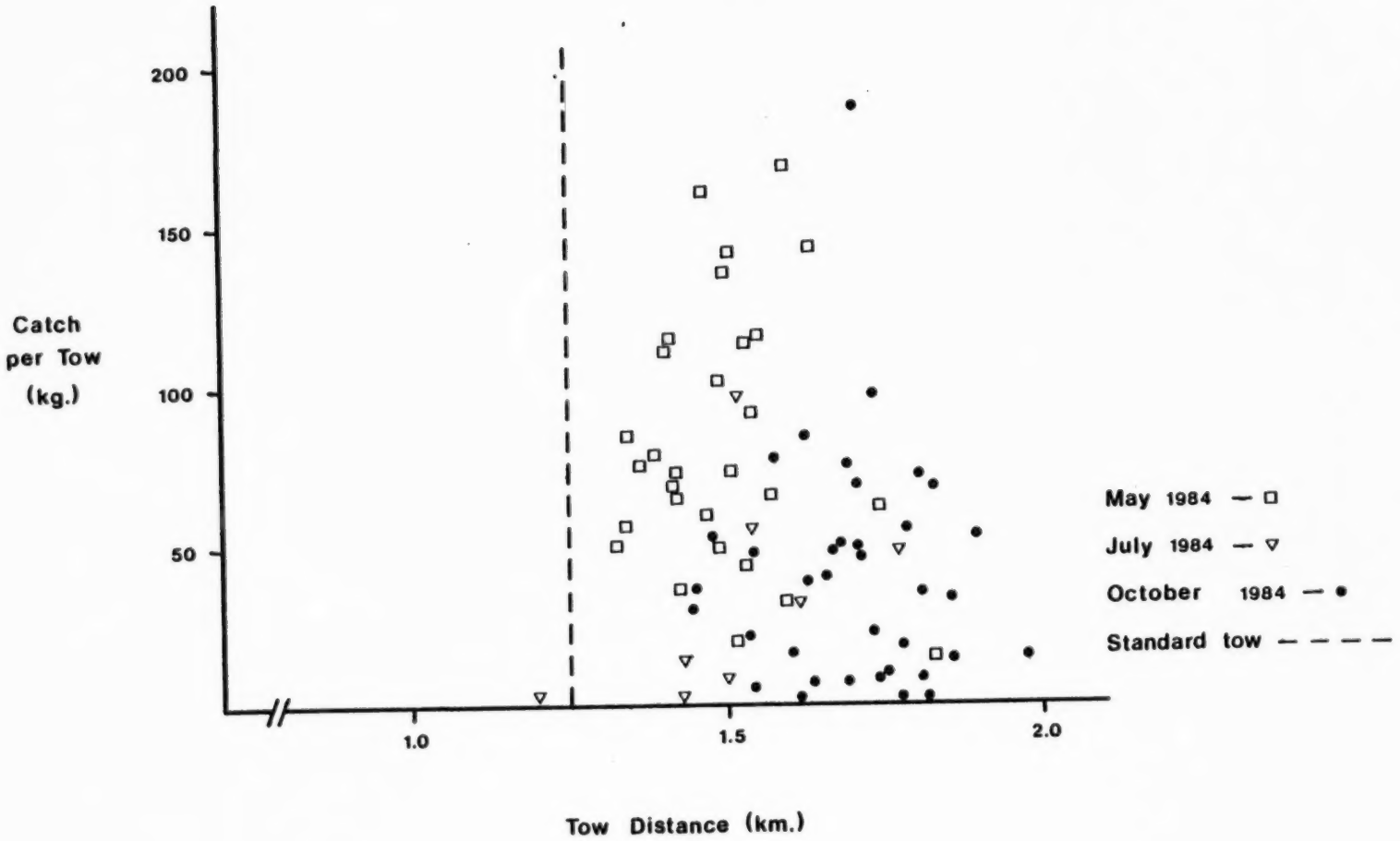

Figure 8. Shrimp catch per tow verses tow distance from research cruises.

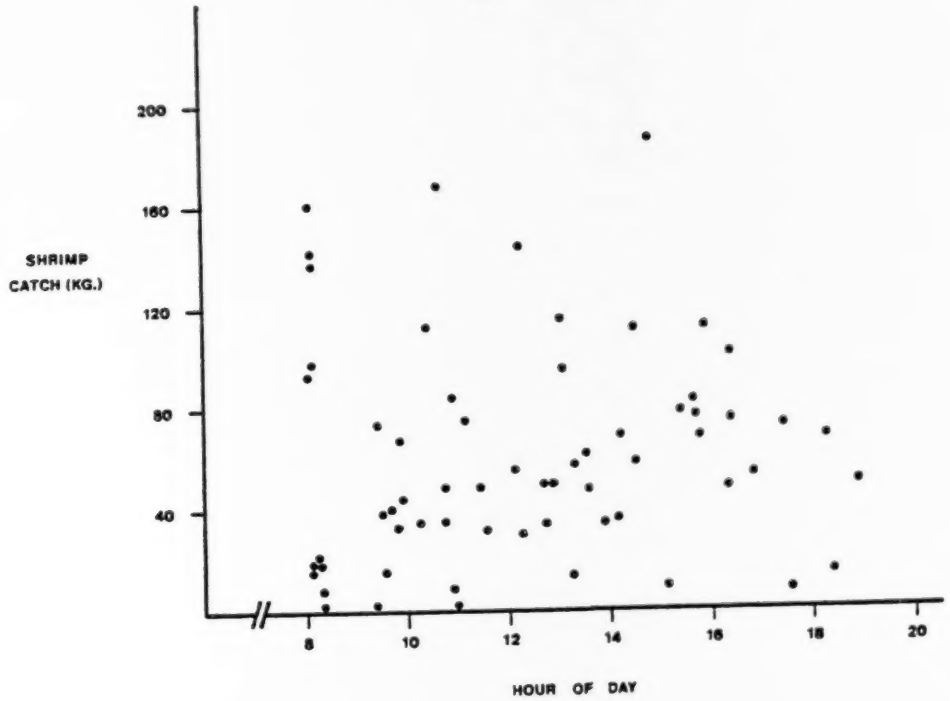

Figure 9. Shrimp catch verses hour of day. (May, July, Oct. 1984)

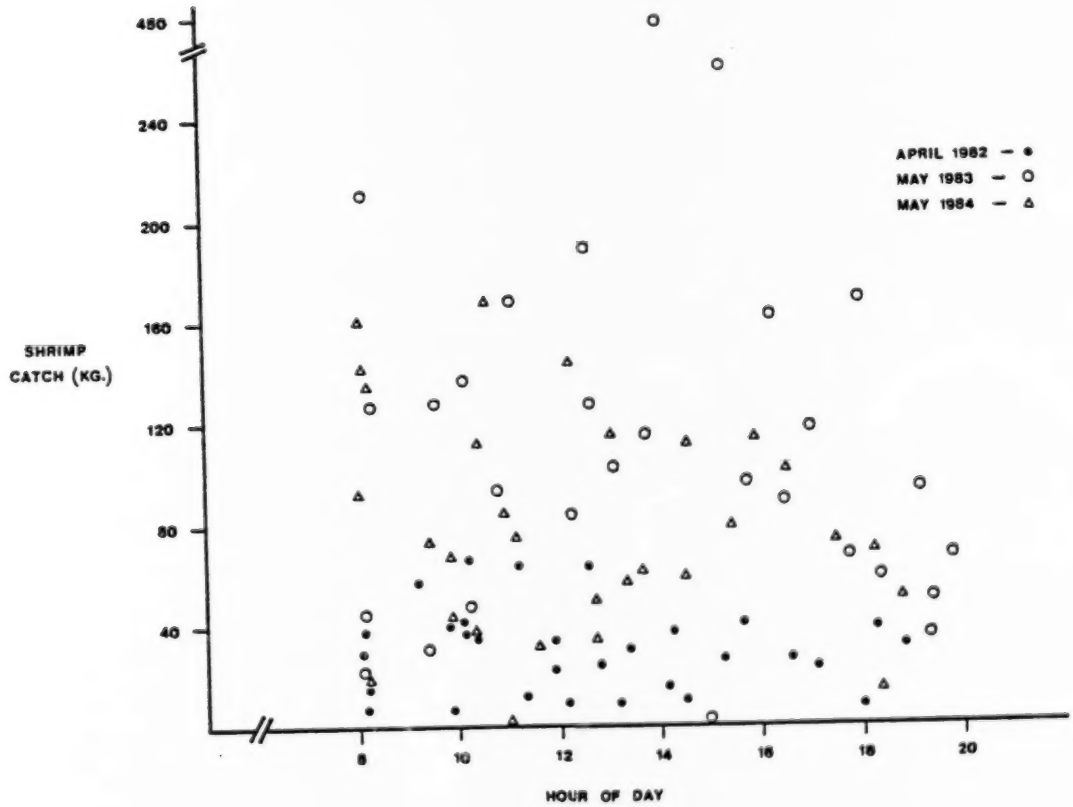

Figure 10. Shrimp catch verses hour of day. (Spring '82-84)

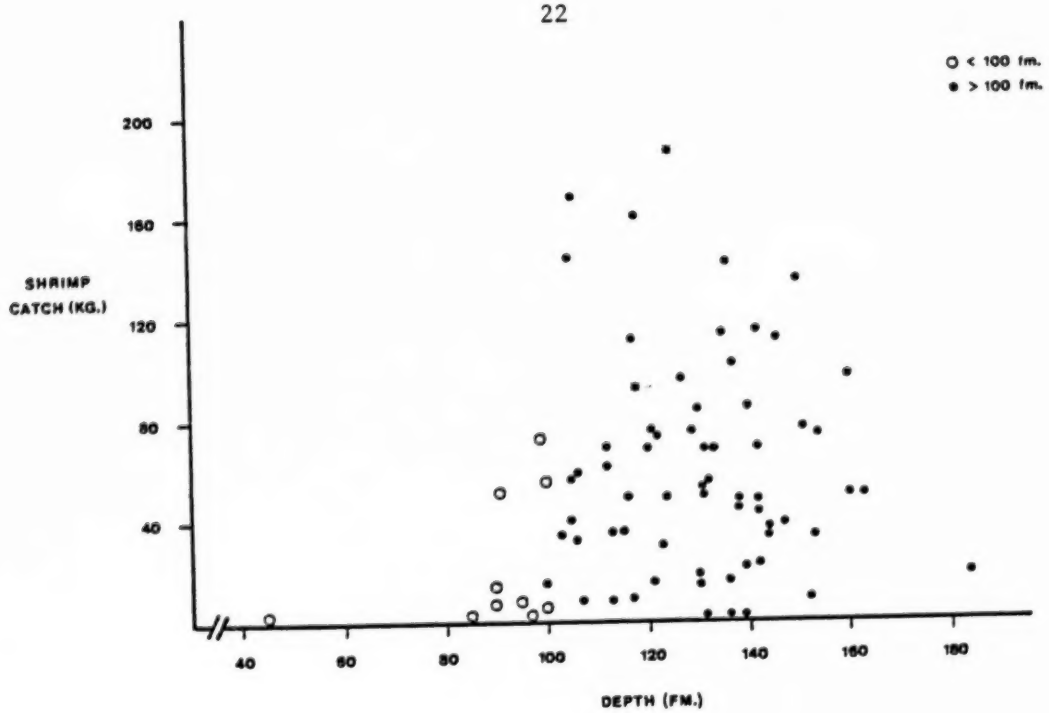

Figure 11. Shrimp catch verses depth of tow. (May, July, Oct. 1984)

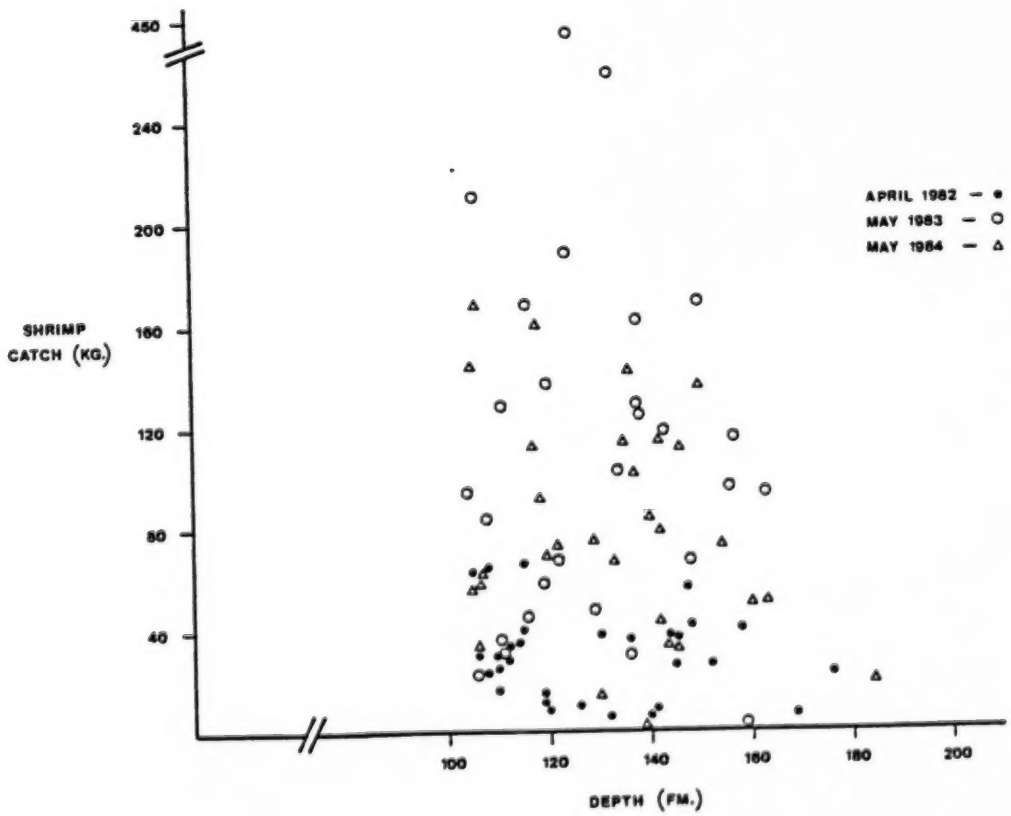

Figure 12. Shrimp catch verses depth of tow. (Spring '82-84)

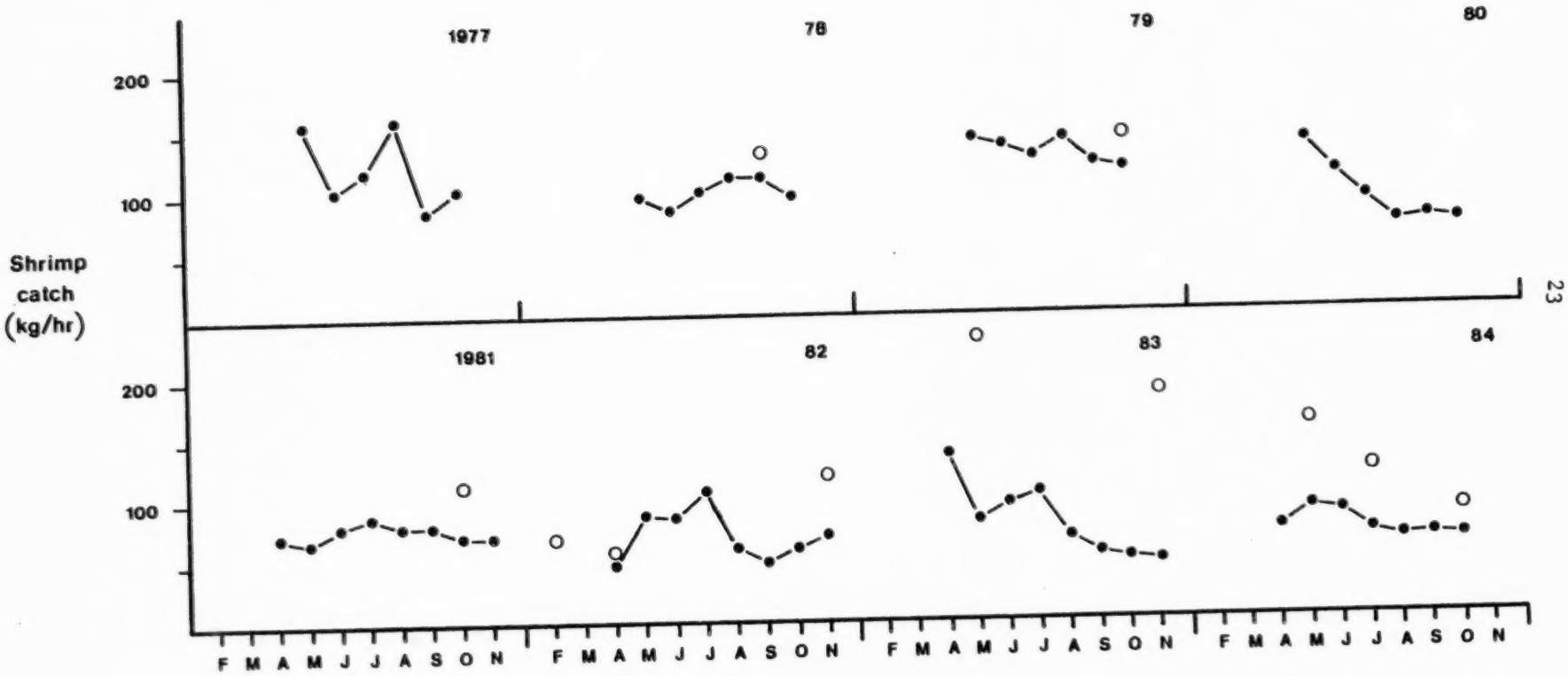

Figure 13. Shrimp catch rates by month from 1977-84.

●—● commercial boats (standardized)
○ research cruises